

THE AUSTRALIAN ALEYRODIDAE (HEMIPTERA-HOMOPTERA).

By L. J. DUMBLETON, Canterbury Agricultural College,
Christchurch, New Zealand.*

(Communicated by Dr. J. W. Evans.)

(Eighty-eight Text-figures.)

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Synopsis.

Descriptions and figures of 22 Australian species, and keys to the subfamilies, genera and species are given. Maskell's eight species and one of the two described by Froggatt are redescribed from cotype material. Three species are cosmopolitan or tropicopolitan and five species are described as new.

The Aleyrodidae so far described from Australia comprise eight species described by Maskell (1896), two species (one of which falls into synonymy) by Froggatt (1911, 1918), two species by Solomon (1935), and three species by Takahashi (1940, 1950). Three cosmopolitan species, presumably introduced, are also known from Australia. The five species described here as new bring the total to 22 species. Solomon remarks on the number of undescribed species present in Western Australia and there is little doubt that the aleyrodid fauna is much larger than this collection indicates, and much larger and more varied than that of New Zealand.

Solomon and Takahashi gave full descriptions of their species, but those of Maskell and Froggatt are inadequate.

Maskell's type material was studied by Quaintance and Baker (1917) who gave extended descriptions of *hirsutus*, *T-signatus* and *banksiae*, but owing to the condition of the type of *banksiae* the figures of that species are not good.

The Maskell type material has now been returned from the U.S. Bureau of Entomology and is in the collections of the Entomological Research Station, Nelson, N.Z., together with the Maskell Collection of Coccidae. Maskell's unmounted duplicate material of some of the species has been located. Some of this has been bleached before mounting, in order to permit the study of detail which it is impossible to make out in the type mounts of some of the black or densely pigmented species. Four undescribed species found amongst Maskell's unmounted material are described here.

The adult stage is known for only seven of the species.

FAMILY ALEYRODIDAE WESTWOOD.

Keys to the Subfamilies of the Aleyrodidae.

Pupal Cases (Australian species only).

With compound or agglomerate pores Udamoscelinae Enderlein.
Without compound or agglomerate pores Aleyrodinae Enderlein.

Adults.

Paronychium spine-like; fore-wing may have, in addition to vein R_s , veins C, S_c , R_1 , Cu, M and A Udamoscelinae.
Paronychium blade-like; fore-wing may have, in addition to vein R_s , veins R_1 and Cu Aleyrodinae.

Subfamily UDAMOSCELINAE.

Key to Genera of Udamoscelinae (Pupal Cases).

8 pairs of compound pores *Synaleurodicus* Solomon.
5-7 pairs of compound pores *Aleurodicus* Douglas.

* Work carried out, in part, while on the staff of the Entomological Research Station, Department of Scientific and Industrial Research, New Zealand.

Key to adults of Australian species of subfamily Udamoscelinae.

Anal vein present in fore wing (*Synaleurodicus*).

Antennae 7-segmented; genital segment in male concealed by sub-triangular lateral flaps; claspers sigmoid; operculum subrectangular; lingula parallel-sided, acutely pointed
 *Synaleurodicus hakeae* Solomon.

Anal vein absent in fore wing (*Aleurodicus*).

Antennae 8-segmented; no lateral flaps concealing genital segment in male; claspers long, slender, curved; operculum semicircular; lingula subconical, apex not acutely pointed
 *Aleurodicus destructor* Mackie.

Genus ALEURODICUS Douglas.

ALEURODICUS DESTRUCTOR Mackie (Text-figs. 1-3).

Aleurodicus destructor Mackie, 1912, *Phillip. agr. Rev.*, 5:142.—Quaintance and Baker, 1913, *Bull. U.S. Bur. Ent.*, 27 (tech. ser.), Pt. 1:56-7, Pl. 13, Figs. 1-7.

Aleurodes alboflocosa Froggatt, 1918, *Agric. Gaz. N.S.W.*, 29:434-6, Figs. 1-4.

Pupal Case (Text-fig. 1).—"Length 1.33-1.5 mm., width 0.83-1.0 mm. Shape sub-elliptical to ovate, some examples narrowed cephalad. Colour yellowish to brownish, empty case colourless. There is a narrow marginal rim composed of the short squarish wax tubes, the incisions being shallow and acute. On the dorsum there are 7 pairs of very conspicuous compound wax pores, six pairs on the abdomen about equally developed and a pair on the cephalic region of about half the size of the former. From the marginal area all around arise a series of spines, 10-12 on a side, and there is a pair cephalad of the vasiform orifice. Vasiform orifice (Fig. 2) subcordate, about as wide as long. Operculum subrectangular, about twice as wide as long. Lingula spatulate, rather short and broad, bearing a pair of spines." (Quaintance & Baker, 1913.)

Female.—Antenna 8-segmented; third segment slightly longer than 4 plus 5, not as long as 4 plus 5 plus 6; 4, 5 and 6 subequal, longer than 7 and 8 which are subequal. Wing immaculate, veins Sc, R₁, R_s and M present.

Male (Text-fig. 3).—Terminal segment longer than wide. Claspers long slender tapering curved, nearly twice as long as terminal segment, and with a small blunt triangular tooth distad of membranous bulge on inner face. Penis long slender tapering curved, more than half as long as claspers. Vasiform orifice subcircular. Operculum subcircular nearly filling orifice. Lingula conical with wide base and two apical setae. Antepenultimate segment has a backwardly-directed process in the mid dorsal line.

Type.—In U.S. National Museum.

Localities.—Dungay, Tweed R., N.S.W., coll. H. Brooks (Froggatt); Hawkesbury R., and Paterson R., N.S.W. (Froggatt); Gippsland, Vict. (Froggatt).

Food Plants.—*Banksia* and several undetermined scrub trees (Froggatt).

Material.—Cotype material of *alboflocosa* in the collection of the Entomological Branch, N.S.W. Department of Agriculture, Sydney.

Froggatt later recognized that his species was a synonym of *Aleurodicus destructor* Mackie and some of his cotype material is so labelled. Examination of this material has confirmed the synonymy.

Genus SYNALEURODICUS Solomon.

SYNALEURODICUS HAKEAE Solomon (Text-figs. 4-8).

Synaleurodicus hakeae Solomon, 1935, *Jour. Roy. Soc. W. Aust.*, 21:79-83, Pl. 9 & 10.

Egg.—Length 0.275 mm., pedicel 0.03-0.10 mm. Shape ellipsoid. Chorion white with rounded, flattened, fissured tubercles.

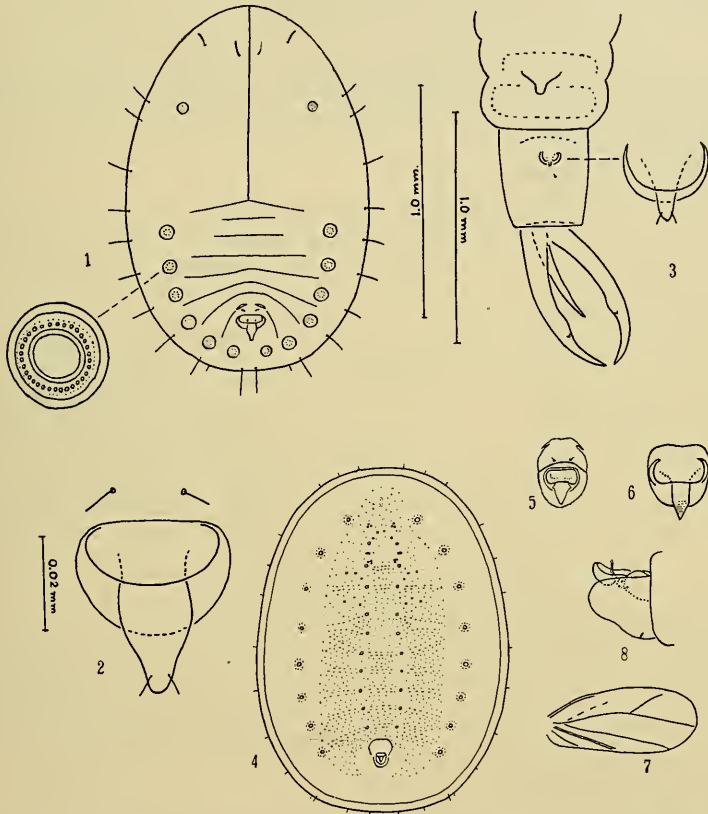
Larva.—*First instar*. Length 0.39 mm., width 0.22 mm. Ovoid, slightly convex. Pale yellow. Red ocelli present. There are 26 small supra-marginal setae. The posterior marginal setae are long, anterior marginal setae short. Vasiform orifice stoutly pyriform, operculum twice as wide as long.

Larva.—*Second instar*. Length 0.64 mm., width 0.41 mm. Similar to third instar.

Larva.—*Third instar*. Length 0.86 mm., width 0.52 mm. Ovoid, slightly convex. Colour pale yellow. Distinct narrow marginal area with minute supra-marginal setae at intervals. Red ocelli present. Two indistinct longitudinal rows of dorsal pores.

Pupal Case (Text-fig. 4).—"Length 1.45 mm., width 1.05 mm., dorsum minutely punctate; slightly convex; outline ovoid, wider posteriorly. Colour: very light yellow

peripherally, with a large central brown area; a pale sutural band occurs behind each of the three thoracic and first seven abdominal segmental areas. Simple wax pores appear as small clear spaces in the brown central area of cephalothorax; some collected into groups; two lateral compressed groups of two or three simple pores in each sutural band of thorax and abdomen, the groups aligned in two longitudinal rows. Eight compound wax pores in a longitudinal row on each side of dorsum; each compound pore appearing as a raised dark brown circlet enclosing a clear depressed area in which appear several circular or oval pores, varying in number from 3 to 7 in the type



1-3. *Aleurodicus destructor* Mackie. 1, Pupal case, dorsal; 2, Pupal case, vasiform orifice; 3, Male, terminal segments of abdomen, dorsal, to show median dorsal process, vasiform orifice and genitalia.

4-8. *Symaleurodicus hakeae* Solomon. (Figures after Solomon.) 4, Pupal case, dorsal; 5, Pupal case, vasiform orifice; 6, Female, vasiform orifice; 7, Male, forewing; 8, Male, genitalia, lateral.

specimen; each of these central pores is continuous with a transparent downwardly-projecting tube, the tubes being enclosed in a cylindrical sheath; on the crest of the brown rim is a circlet of small pores. Tracheal folds not evident. Narrow marginal band marked by fine radial striations, and bearing 26 small supra-marginal setae, with a posterior pair of longer infra-marginal setae; small bilobed supra-marginal processes occur between the setae. Vasiform orifice (Fig. 5) with upraised bright yellow rim of which the outer margin is obtuse anteriorly, but otherwise sub-circular; adjoining this anteriorly is an elevated area, rounded in front and bearing a posterior pair of small spines; the rim passes obliquely downward into the orifice where it has a sub-cordate inner margin and is raised into several intermediate ridges; operculum just over twice as wide as long, anterior and posterior borders slightly concave, lateral

borders convex; projecting part of lingula widens a little, then tapers with minute crenulations to posterior end, which reaches almost to the outer margin of the orifice rim; lingula and posterior part of operculum finely setose dorsally." (Solomon.)

Female (Text-fig. 6).—Length 2.33 mm. Colour yellow with brown markings on frons, clypeus, and part of epicranium; antennae, sides of thorax, pronotum, coxae, and basal sclerites of abdomen dark brown. Antennae 0.78 mm. long. Segment 3 as long as 4 plus 5, 5 is two-thirds length of 4, 6 two-thirds length of 5, 7 two-thirds length of 6. No sensoria on antenna. Forewing 2.33 mm. long. R₁, R_s, M, and A distinct. Operculum (Text-fig. 6) twice as wide as long, posterior margin slightly concave. Lingula projecting, sides sub-parallel, apex pointed.

Male.—Length 1.93 mm. Antennae 0.59 mm. long. Forewing (Text-fig. 7) 1.75 mm. long. A pair of large lateral subtriangular flaps (Text-fig. 8) on the abdomen conceal most of the terminal segment and genital apparatus. Claspers somewhat sigmoid, basal part narrower than the rest. Penis sub-sigmoid.

Type.—Not designated.

Type Locality.—Cottesloe, Perth, W.A.

Food Plant.—*Hakea prostrata*.

Subfamily ALEYRODINAE.

Key to adults of Australian species of the Subfamily Aleyrodinae.

1. Wings maculated (2)
Wings not maculated (3)
2. Wings with dark brown maculation; operculum subrectangular concave posteriorly *Neomaskellia bergii* Signoret.
Wings with reddish maculation; operculum subtrapezoidal, wider posteriorly *Aleurocanthus T-signatus* Maskell.
3. Lingula truncate apically *Trialeurodes vaporariorum* Westwood.
Lingula rounded apically (4)
4. Antennal segment 3 equal to 5 plus 6 plus 7; operculum trapezoidal *Aleurotrachelus dryandrae* Solomon.
Antennal segment 3 longer than 5 plus 6 plus 7; operculum transverse, concave posteriorly *Aleyrodes atriplex* Froggatt.

Key to Genera of Aleyrodinae (Pupal cases).

(Australian species only.)

1. Lingula very short, or knobbed and lobed (2)
Lingula of normal length, subparallel-sided or constricted at base, rounded or pointed apically (3)
2. Sides of pupa case deflexed underneath; no papillae on dorsal disc or submargin; lingula short *Neomaskellia* Q. & B.
Sides not deflexed; papillae present, lingula long; knobbed and lobed *Trialeurodes* Cockerell.
3. Submarginal area defined (4)
Submarginal area not defined (8)
4. Submargin defined by presence of papillae (5)
Submargin defined by line or fold, or by presence of submarginal striations (6)
5. Papillae rounded; thoracic folds, pores and combs absent; anal furrow present *Aleuroclava* Singh.
Papillae sub-cylindrical; thoracic tracheal folds, pores and combs present; anal furrow absent *Orchamus* Q. & B.
6. Thoracic and abdominal tracheal pores invaginated, thoracic folds present *Dialeurodes* Cockerell.
Not as above (7)
7. Margin with two rows of teeth; body rather pointed anteriorly; median abdominal ridge present *Aleurotrachelus* Q. & B.
Not as above. One row of teeth; body elliptical; no abdominal ridge present *Tetraleurodes* Q. & B.
8. Vasiform orifice and lingula long and pointed; anal furrow present (9)
Not as above (10)
9. Adult shape outlined by two longitudinal tuberculate lines *Asterobemisia* Trehan.
Not as above *Bemisia* Quaintance & Baker.
10. Pale species, shape elliptical, submarginal setae present, but few on disc *Aleyrodes* Latreille.
Dark species, often pointed anteriorly, and with numerous discal setae in addition to submarginal setae and with abdominal segments limited laterally and with rays extending towards submargin *Aleurocanthus* Q. & B.

Genus ALEUROCANTHUS Quaintance & Baker.

Key to pupal cases of Australian species.

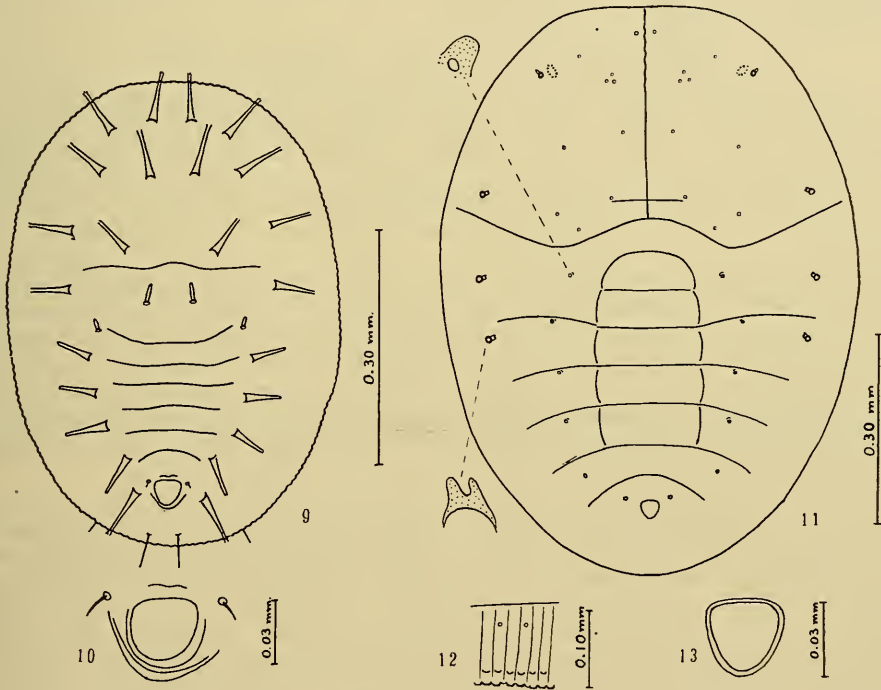
1. With somewhat flattened anterior margin; apparent margin not toothed; margin vertical, toothed, apices of teeth truncate, apparent 2nd row of teeth mesad; 4 pairs of modified pores on disc laterad, 2 on cephalothorax and 2 on anterior half of abdomen *banksiae* Maskell.
Rather pointed anteriorly; margin with single row of rounded teeth; with numerous long fine setae or stout spines (2)
2. Thoracic tracheal folds present; body constricted across thoracic pores, abdominal tracheal pore invaginated, all pores with 5-6 smaller teeth; about 22 long thin setae on each side on submargin; eye spots absent *hirsutus* Maskell.
Folds and pores absent; body not constricted; 12 stout spines laterad on disc on each side; eye spots present *T-signatus* Maskell.

ALEUROCANTHUS BANKSIAE Maskell (Text-figs. 9-13).

Aleurodes banksiae Maskell, 1896, *Trans. Proc. N.Z. Inst.*, 28:423-4, Pl. 25, Fig. 1 a-f.

Aleyrodes banksiae Mask. Cockerell, 1902, *Proc. Acad. nat. Sci. Philad.*, 54:281.—Kirkaldy, 1907, *Bull. 2, Div. Ent. Hawaii*, p. 47.—Quaintance, 1908, *Genera Insect.*, fasc. 87, p. 5.

Aleurocanthus banksiae (Mask.), Quaintance & Baker, 1914, *Bull. U.S. Bur. Ent.*, 27 (tech. ser.), Pt. 2:102.—Quaintance & Baker, 1917, *Proc. U.S. nat. Mus.*, 51:339-40, and footnote p. 335, Pl. 33, figs. 1-5.



9-13. *Aleurocanthus banksiae* Maskell. 9, Larva, dorsal; 10, Larva, vasiform orifice; 11, Pupal case, dorsal; 12, Pupal case, margin; 13, Pupal case, vasiform orifice.

Larva (Text-fig. 9).—Length 0.60 mm., width 0.42 mm. Colour brown. Shape elliptical, flat. Margin crenulated, about 12 teeth in 0.1 mm. Segmentation as in figure. Four rows, each of four strong setae on thorax, setae bifid or trifid apically. Abdomen with six pairs of similar setae. Those on 1st segment are smaller and more slender and those on 2nd segment are smaller, short and stumpy. Setae on 8th segment small, caudal setae larger. Posterior marginal setae present. Vasiform orifice (Text-fig. 10) subcircular, 0.03 mm. long. Operculum filling orifice. Lingula not discernible.

Pupal Case (Text-fig. 11).—Length 0.98 mm., width 0.70 mm. Colour black. Shape elliptical, somewhat flattened anteriorly. Dorsum flat with vertical sides 0.10 mm. high. Apparent margin straight but vertical margin (Text-fig. 12) ribbed or striate, about 7 ribs in 0.1 mm. There is a row of minute pores near the top of the vertical margin, the marginal teeth are square-ended and sometimes notched and irregular. Mesad of the marginal teeth is a row of teeth or tubercles. Abdominal segments distinct, limited laterally. Sutures, pores, and segmentation as in figure. Transparent eye spots present with pore or short process just laterad of each. A similar process just cephalad of transverse moulting suture laterally and two on each side on the anterior lateral abdominal area. Mesad of these latter are five pairs of pores or processes on abdominal segments 3–7. Vasiform orifice (Text-fig. 13) sub-triangular, 0.035 mm. long and same width. Operculum filling orifice. Lingula not discernible.

Adult.—Unknown.

Lectotype.—Pupal case on slide mount in Maskell Collection. This has been bleached and remounted.

Type Locality.—Melbourne, Vict., coll. C. French.

Food Plants.—*Banksia integrifolia* and *Callistemon linearis*.

Material.—Slide mount of larva in Maskell Collection. No unmounted duplicate material.

This species was placed in *Aleurocanthus* by Quaintance and Baker with some hesitation and mainly on larval characters. The two rows or marginal teeth suggest *Aleurotrachelus* but there is no median ridge.

ALEUROCANTHUS HIRSUTUS Maskell (Text-figs. 14–20).

Aleurodes hirsuta Maskell, 1896, *Trans. Proc. N.Z. Inst.*, 28:434, Pl. 31, fig. 1.

Aleyrodes hirsuta Mask., Cockerell, 1902, *Proc. Acad. nat. Sci. Philad.*, 54:281.—Kirkaldy, 1907, *Bull. 2, Div. Ent. Hawaii*, p. 57.—Quaintance, 1908, *Genera Insect.*, fasc. 87, p. 6.

Aleurocanthus hirsutus (Mask.), Quaintance & Baker, 1914, *Bull. U.S. Bur. Ent.*, 27 (tech. ser.), Pt. 2:102.—Quaintance & Baker, 1917, *Proc. U.S. nat. Mus.*: 343–4, Pl. 34, fig. 10–15.

Larva (Text-fig. 14).—Length 0.60 mm., width 0.45 mm. Colour yellowish. Shape elliptical, slightly constricted across thoracic folds, flat. About 6 narrower modified teeth (Text-fig. 15) in thoracic tracheal pore area. Slight invagination in abdominal pore area but no modified teeth. About 7 minute setae mesad of margin on each side. One pair cephalic, one pair 1st abdominal and one pair 8th abdominal setae short. Caudal setae longer. Twenty-eight longer setae on each side as in figure, trifid at tips. Vasiform orifice (Text-fig. 16) subtriangular, 0.04 mm. long, 0.028 mm. wide. Operculum nearly filling orifice, 0.023 mm. long, 0.020 mm. wide. Lingula obscured.

Pupal Case (Text-fig. 17).—Length 1.02 mm., width 0.76 mm. Colour yellowish-brown. Shape elliptical, constricted across thoracic folds, slightly invaginated caudally, flat. Margin toothed, about 13 teeth in 0.1 mm. Thoracic tracheal folds present, pore area (Text-fig. 18) with about 6 smaller teeth. Abdominal pore area (Text-fig. 19) similar. About 22 sub-marginal and 14 discal setae on each side, long, tips trifid. About 4 pairs of minute setae on anterior sub-margin. One pair of short cephalic setae. Caudal setae and 8th abdominal setae short. Vasiform orifice (Text-fig. 20) somewhat egg-shaped, length 0.05 mm., width 0.045 mm., floor of orifice reticulate. Operculum not wholly filling orifice, length 0.03 mm., as wide as long, trapezoidal, slightly emarginate laterally. Lingula obscure, (?) broadly triangular.

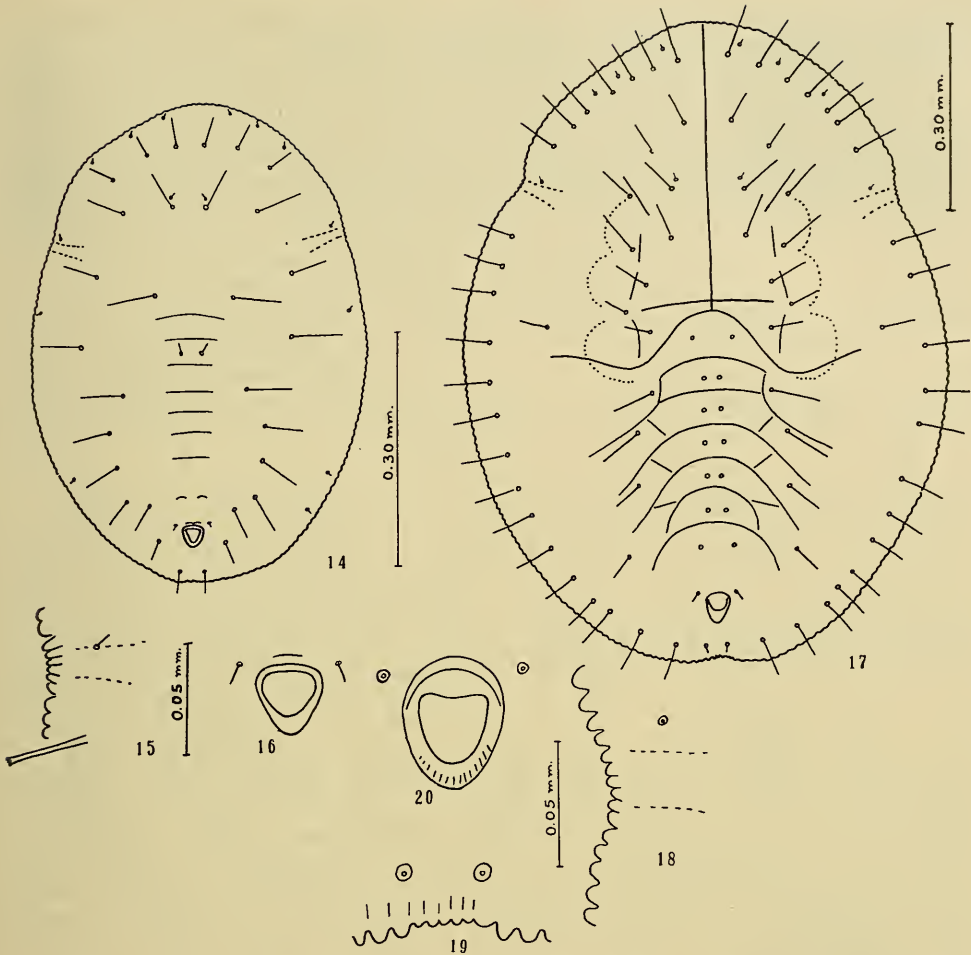
Adult.—Unknown.

Lectotype.—Pupal case on slide mount in Maskell Collection.

Type Locality.—Sydney, coll. Froggatt.

Food Plant.—*Acacia longifolia*.

The type may be a parasitized specimen. The sutures, segmentation and other details are difficult to discern. The species is figured here from Maskell duplicate material. Quaintance and Baker (1917) appear to be inaccurate in their measurements of body length and size of teeth.



14-20. *Aleurocanthus hirsutus* Maskell. 14, Larva, dorsal; 15, Larva, thoracic tracheal fold and comb; 16, Larva, vasiform orifice; 17, Pupal case, dorsal; 18, Pupal case, thoracic tracheal fold and comb; 19, Pupal case, caudal margin; 20, Pupal case, vasiform orifice.

ALEUROCANTHUS T-SIGNATUS Maskell (Text-fig. 21-25).

Aleurodes T-signata Maskell, 1896, *Trans. Proc. N.Z. Inst.*, 28:433-4, Pl. 35, fig. 2.

Aleyrodes T-signata Mask., Cockerell, 1902, *Proc. Acad. nat. Sci. Philad.*, 54:281.
—Kirkaldy, 1907, *Bull.* 2, *Div. Ent. Hawaii*, p. 72.—Quaintance, 1908, *Genera Insect.*, fasc. 87, p. 8.

Aleurocanthus signatus (Mask.), Quaintance and Baker, 1914, *Bull. U.S. Bur. Ent.*, 27 (tech. ser.), Pt. 2:102.

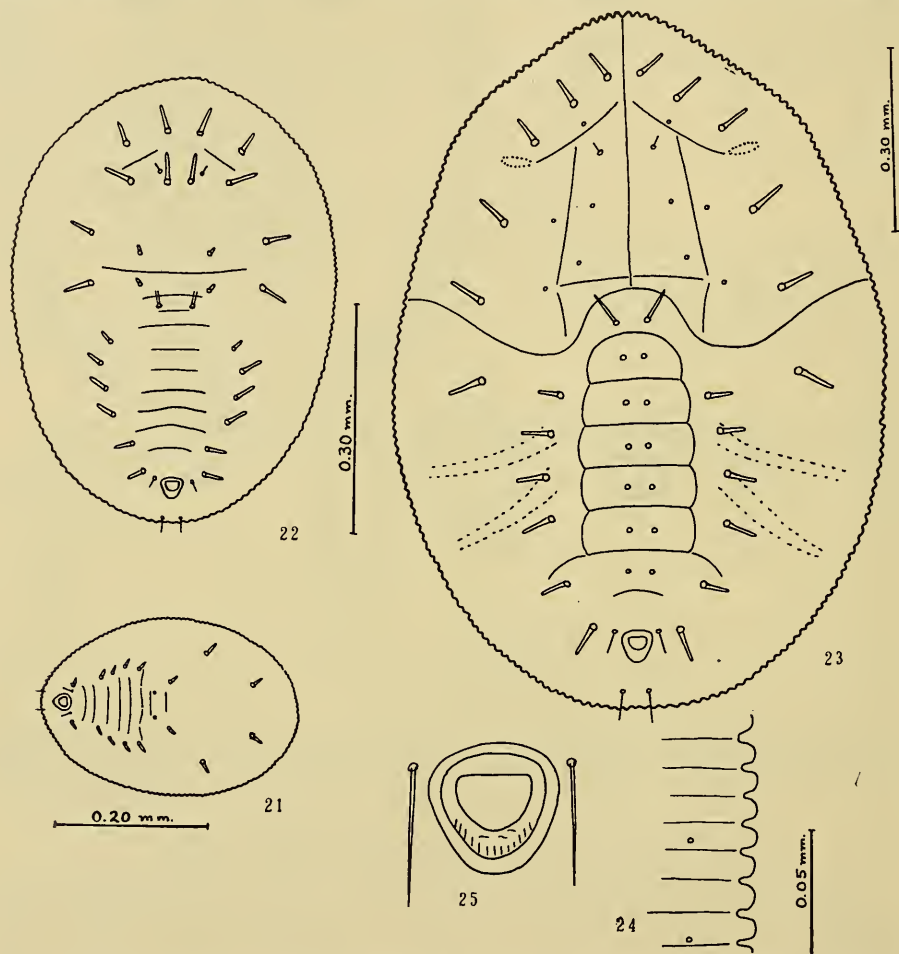
Aleurocanthus T-signatus (Mask.), Quaintance and Baker, 1917, *Proc. U.S. nat. Mus.*, 51:353-5, Pl. 39, fig. 1-9.

Egg.—(Ovarian, Q. & B., 1917), 0.23 mm. long, 0.12 mm. wide, oval, somewhat crescentic, colour light brown.

Larva (early instar) (Text-fig. 21).—Length 0.35 mm., width 0.24 mm. Colour light brown. Shape elliptical. Margin toothed, about 24 teeth in 0.1 mm. Segmentation, pores and setae as in figure. Cephalothorax with 3 pairs of short stout spines (the setae described by Quaintance and Baker (1917) are not evident), abdomen with one pair of para-median pores on 1st segment and 5 pairs of short stout spines on segments

3-6 and 8. One pair of setae on 8th segment and one pair caudal setae. Orifice sub-circular. Operculum subtriangular, occupying most of orifice.

Larva (later instar) (Text-fig. 22).—Length 0.60 mm., width 0.45 mm. Shape elliptical. Colour brown. Margin toothed, about 14 teeth in 0.10 mm. Segmentation, pores and setae as in figure. Six stout spines on each side of cephalothorax, one pair short cephalic paramedian setae, two pairs of short spines posteriorly on thorax. One pair of paramedian processes on 1st abdominal segment, six pairs of stout spines laterad between segments 2 and 8. One pair of setae on 8th segment and one pair of caudal setae.



21-25. *Aleurocanthus T-signatus* Maskell. 21, Larva, early instar, dorsal; 22, Larva, late instar, dorsal; 23, Pupal case, dorsal; 24, Pupal case, margin; 25, Pupal case, vasiform orifice.

Pupal Case (Text-fig. 23).—Length 1.08 mm., width 0.77 mm. Colour dark brown to black. Shape elliptical, rather straight-sided and pointed anteriorly. Flat, with a median ridge on thorax and abdomen. Margin toothed, about 9 teeth in 0.1 mm. Margin (Text-fig. 24) radially striate with minute pores about 0.03 mm. mesad of teeth. Five pairs of stout spines on cephalothorax and one pair of paramedian cephalic setae. Eye spots present, transparent. Abdomen with one pair of paramedian spines on 1st segment, 6 pairs of para-median pores on succeeding segments and 7 pairs of spines laterad of these. One pair of 8th abdominal and one pair of caudal setae present. Tracheal folds, pores and combs absent. Abdominal segments distinct, limited laterally.

Two prominent rays or curved troughs of lighter pigmentation extending toward margin from third and fourth segments. Vasiform orifice (Text-fig. 25) sub-circular, length 0.05 mm. Operculum semicircular, width 0.03 mm., length 0.22 mm., not completely filling orifice. Floor of orifice coarsely reticulate, posterior margin ribbed.

Female (specimen in poor condition).—Forewing 1.24 mm. long, width 0.5 mm., vein R_1 absent. Forewing with four red patches, two on each side of radial vein, posterior proximal spot asymmetrical T-shape, base standing on posterior margin, long arm directed to base of wing. Hind tibia with about 20 setae in comb. Operculum transverse, concave posteriorly. Lingula not discernible.

Lectotype.—Slide mount of pupal case in Maskell Collection.

Type locality.—Botany, near Sydney, coll. Froggatt.

Material.—Four slide mounts in Maskell Collection: 1 early larva, 1 late larva, 1 pupa and 1 adult female.

Food plant.—*Acacia longifolia*.

Aleurotrachelus limbatus and *Aleurocanthus hirsutus* are recorded from the same food plant and the same general locality.

ALEUROCLAVA ELLIPTICAE, n. sp. (Text-fig. 26–28).

Aleurodes decipiens Maskell, 1896 (in part—pupa), *Trans. Proc. N.Z. Inst.*, 28:428–9, Pl. 28, fig. 1e and 1f.

Bemisia decipiens (Mask.), Quaintance & Baker, 1914, *Bull. U.S. Bur. Ent.*, 27 (tech. ser.), Pt. 2: p. 100. (In part—pupa.)

In Maskell's description of *decipiens* the description of the larva has page precedence and Maskell noted that the pupa was smaller in size and had a different vasiform orifice. The presumed larva is in fact a pupa and must stand as the type of *decipiens*. The pupa is described below as a new species.

Larva.—Unknown.

Pupal Case (Text-fig. 26).—Length 1.24 mm., width 0.8 mm. Colour yellowish. Shape elliptical, flattish. Tracheal folds, pores and combs absent. Margin (Text-fig. 27) crenulate, about 16 crenulations in 0.1 mm. About 33 sub-marginal rounded papillae on each side. Sub-marginal area with slight radial striations. Mesad of the papillae are two rows of minute pores. Disc with small sub-circular pustules. One pair of cephalic, one pair of 1st abdominal, one pair of 8th abdominal and one pair of caudal setae. Vasiform orifice (Text-fig. 28) subcordate, length 0.04 mm., width 0.04 mm., anterior margin straight. Operculum sub-triangular, 0.022 mm. long, 0.03 mm. wide, occupying most of orifice. Lingula not clearly discernible. Anal furrow present, contouring orifice laterally and extending to caudal margin, expanded at mid-length, narrowed at margin.

Adult.—Unknown.

Lectotype.—Slide mount of pupal case (labelled as pupa of *decipiens*) in Maskell Collection.

Type locality.—Botany, near Sydney, coll. Froggatt.

Food plant.—*Styphelia (Monotoca) elliptica*.

This species is apparently congeneric with another species described as new from *Eucalyptus globulus* in New Zealand, but probably of Australian origin. It is not a typical *Bemisia* or *Asterobemisia* and, while it differs from *Aleuroclava* in the presence of a sub-margin, it appears to come nearest to that genus.

Genus ALEUROTRACHELUS Quaintance & Baker.

Key to pupal cases of Australian species.

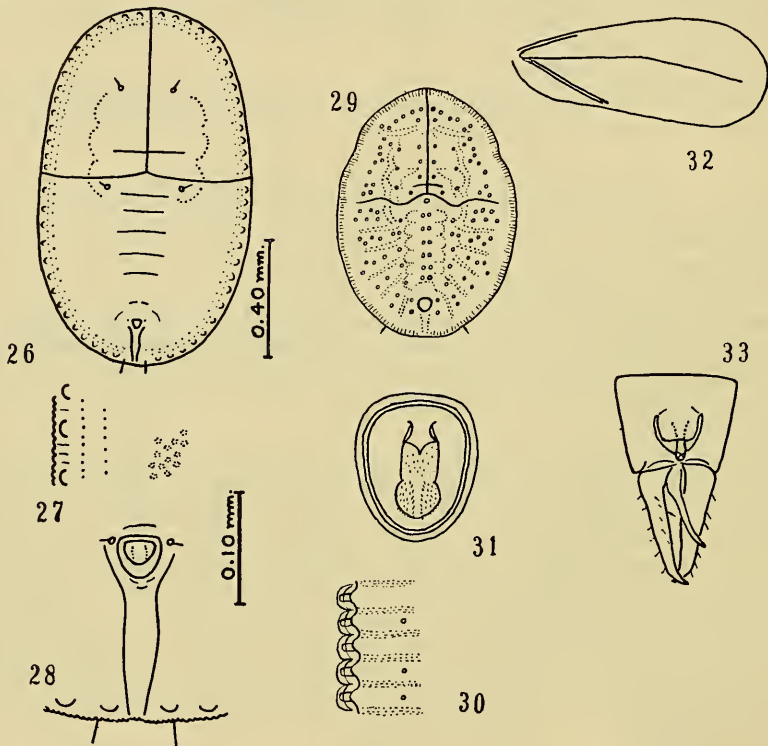
- Teeth of inner marginal row truncate apically; lateral abdominal areas with traces only of ridges near 7th and 8th segments; pores on dorsum sparse and small; operculum sub-triangular *A. limbatus* Maskell.
- Teeth of inner marginal row with rounded apices; lateral abdominal area with 4 or 5 prominent ridges opposite segments 3 to 6; pores larger and more numerous especially on cephalic and lateral thoracic areas and between lateral, abdominal ridges; operculum sub-cordate *A. dryandrae* Solomon.

ALEUROTRACHELUS DRYANDRAE Solomon (Text-fig. 29–33).

Aleurotrachelus dryandrae Solomon, 1935, *Jour. Roy. Soc. W. Aust.*, 21:83–86, Pl. 11 and 12.

Egg.—Length 0.22 mm., pedicel 0.13 mm. long. Shape subreniform. Chorion dark brown, reticulated.

Larva.—*First Instar*. Length 0.29 mm., width 0.19 mm. Colourless when newly hatched, becoming black. Nine marginal setae on each side. One pair cephalic setae very large, the pair on first abdominal segment slightly shorter. Two pairs of small setae near vasiform orifice. Vasiform orifice occupies the posterior part of a clearly demarcated area of the integument. Orifice subcordate, operculum filling orifice.



26–28. *Aleuroclava ellipticae*, n. sp. 26, Pupal case, dorsal; 27, Pupal case, margin; 28, Pupal case, vasiform orifice, anal furrow and caudal margin.

29–33. *Aleurotrachelus dryandrae* Solomon. (Figures after Solomon.) 29, Pupal case, dorsal; 30, Pupal case, margin; 31, Pupal case, vasiform orifice; 32, Female, forewing; 33, Male, vasiform orifice and genitalia.

Larva.—*Second Instar*. Length 0.46 mm., width 0.33 mm. Sub-margin with 18 small erect setae.

Larva.—*Third Instar*. Length 0.74 mm., width 0.58 mm.

Pupal Case (Text-fig. 29).—“Length 1.24 mm., width 0.92 mm. The older larvae or pupal cases appear black, usually metallic, with a marginal fringe of wax. Dorsum pitted, with raised median part; outline subovate. A well-defined sinuous line follows a ridge of similar form between thoracic and abdominal regions; from midpoint of this a median line runs to the anterior margin, thus marking the position of the T-shaped rupture by which the imago emerges; thoracic region with prominent median ridge sagittiform anteriorly, and two prominent lateral ridges; prominent median ridge of abdominal area marked by seven transverse ridges; on surrounding flat area of dorsum is a radiating series of five prominent ridges on each side directed laterally

and posteriorly. Numerous raised circular pores on dorsum, each with a central column. Thoracic and caudal tracheal folds very faintly indicated. Margin (Text-fig. 30) crenulated, with two series of teeth, the outer much paler than the inner; wax tubes well developed; a series of small spines a little within the margin, and a row of minute pores internal to these; dorsum just internal to margin bears ridges corresponding to the crenulations; an anterior and a posterior pair of marginal setae. Vasiform orifice (Text-fig. 31) subcordate, situated between two ridges on a palmate area on posterior part of the median dorsal ridge where it slopes down toward the posterior margin; operculum filling the orifice; lingula included, setose; a pair of small setae on each side of orifice, another pair anterior to it." (Solomon.)

Female.—Length 1.28 mm. Colour yellow, legs, front of head, second segment of antenna, mesosternal region, some dorsal areas on thorax, operculum and a large median area anterior to it grey. Antennae 0.35 mm. long; segment 3 with 3 sensoria apically, longer than segments 4–6 combined; 4 about two-thirds the length of 5; 5 with single apical sensorium, shorter than 6; 6 slightly longer than 7; 7 with sensorium very near tip. Forewing (Text-fig. 32) 1.22 mm. long, R strongly bent just beyond middle, R₁ distinct, Cu a clear line in wing. Operculum broader than long but narrowing posteriorly, posterior margin slightly concave. Lingula narrow cylindrical, slightly enlarged distally, apex with several obtuse lobes.

Male.—Length 0.97 mm. Antenna 0.29 mm. long. Claspers 0.12 mm. long. Forewing 0.94 mm. long. Colour as in female, except for transverse brown markings on abdomen and the brown colour of the genital segment. Claspers as in Text-fig. 33. Penis enlarged basally, curved strongly upwards.

Type.—Not designated.

Type locality.—Crawley, Perth, W.A.

Type food plant.—*Dryandra floribunda*.

Other food plants.—*Hakea* spp., *Banksia* sp., *Grevillea* sp., *Dryandra* sp.

ALEUROTRACHELUS LIMBATUS Maskell (Text-fig. 34-39).

Aleurodes limbata Maskell, 1896, *Trans. Proc. N.Z. Inst.*, 28:436, Pl. 38, fig. 1.

Aleyrodes limbata Mask., Cockerell, 1902, *Proc. Acad. nat. Sci. Philad.*, 54:281. —Kirkaldy, 1907, *Bull. 2, Div. Ent. Hawaii*, p. 60.—Quaintance, 1908, *Genera Insect.*, fasc. 87, p. 6.

Aleurotrachelus limbatus (Mask.), Quaintance & Baker, 1914, *Bull. U.S. Bur. Ent.*, 27 (tech. ser.), Pt. 2:103.

Larva (Text-fig. 34).—Larval exuviae usually or often attached to pupal case. Length 0.60 mm., width 0.40 mm. Colour brown. Shape elliptical, anterior part of case usually crumpled or folded back. Margin (Text-fig. 35) with two rows of teeth, outer rounded, inner truncate apically, about 12 or 13 teeth in 0.1 mm. Tracheal folds, pores and combs absent. Minute pores mesad of inner row of teeth, one mesad of each fourth or fifth tooth. Segmentation and pores as in figure. A pair of paramedian pores with long processes on first abdominal segment. One pair of caudal setae and one pair on eighth abdominal segment. Vasiform orifice (Text-fig. 36) length 0.03 mm., width 0.035 mm., subcircular, with a fold contouring it laterally and posteriorly. Operculum subtriangular, sides concave, length 0.018 mm., width 0.022 mm. Lingula obscured, (?) finger-like.

Pupal Case (Text-fig. 37).—Length 0.95 mm., width 0.65 mm. Colour dark brown. Shape elliptical, somewhat pointed anteriorly, very slightly constricted across thoracic tracheal folds. Margin (Text-fig. 38) with two rows of teeth, outer rounded, about 10 teeth to 0.1 mm., inner truncate, dark. A minute pore mesad of each second tooth. Thoracic tracheal folds visible, two teeth in pore area sometimes slightly smaller. No abdominal tracheal fold, little or no marginal invagination, two teeth in pore area sometimes slightly smaller. Median ridge narrow in cephalic area, wide on abdomen. Segmentation, pores and setae as in figure. One pair of caudal setae and one pair on eighth segment. First abdominal segment with two nearly contiguous paramedian pores producing long processes. Vasiform orifice (Text-fig. 39) subcircular, 0.04 mm. long.

Operculum subtriangular, 0.03 mm. long, as wide as long, laterally concave. Lingula obscured.

Adult.—Unknown.

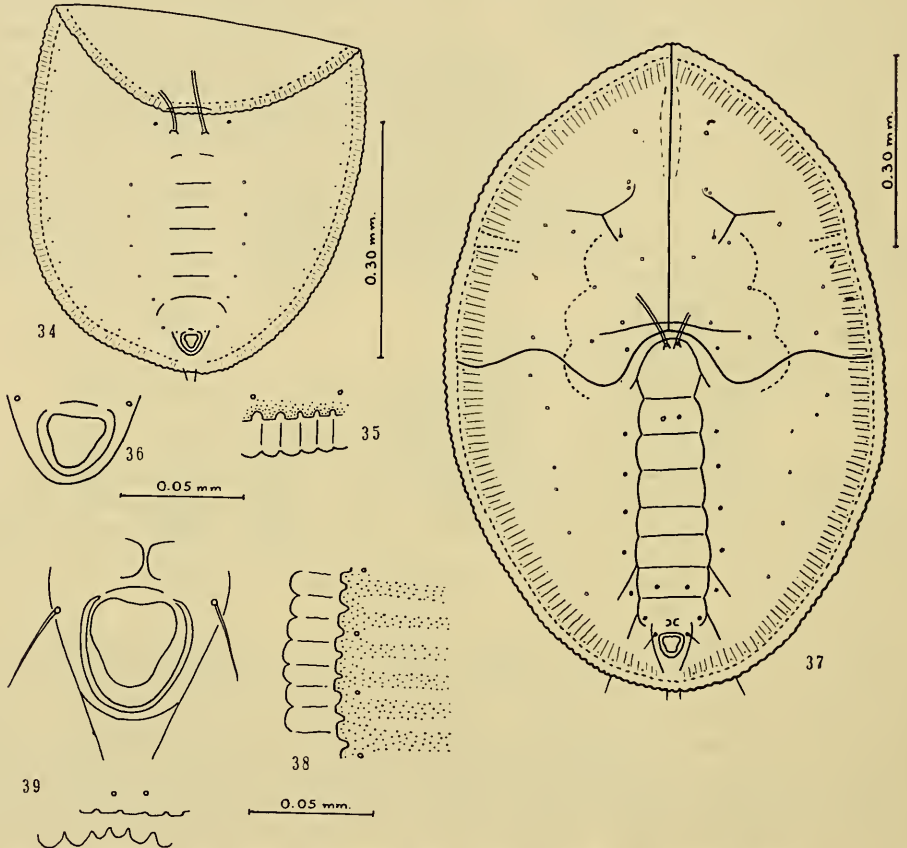
Lectotype.—Slide mount of pupal case (labelled *limbata*) in Maskell Collection.

Type locality.—Sydney, coll. Froggatt. (Also from Kurrajong Heights, coll. Musson.)

Food plants.—*Acacia longifolia* (Sydney). *Leucopogon juniperinus* (Kurrajong Heights).

Material.—Slide mount of larva and slide mount of pupal case (labelled *croceata*) and duplicate unmounted material in Maskell Collection.

This species was also present in Maskell duplicate material of *croceata* from *Styphelia* (*Monotoca*) *elliptica* from Botany, near Sydney.



34-39. *Aleurotrachelus limbatus* Maskell. 34, Larva, dorsal; 35, Larva, margin; 36, Larva, vasiform orifice and caudal margin; 37, Pupal case, dorsal; 38, Pupal case, margin; 39, Pupal case, vasiform orifice.

Genus ALEYRODES Latreille.

ALEYRODES ATRIPLEX Froggatt (Text-fig. 40-45).

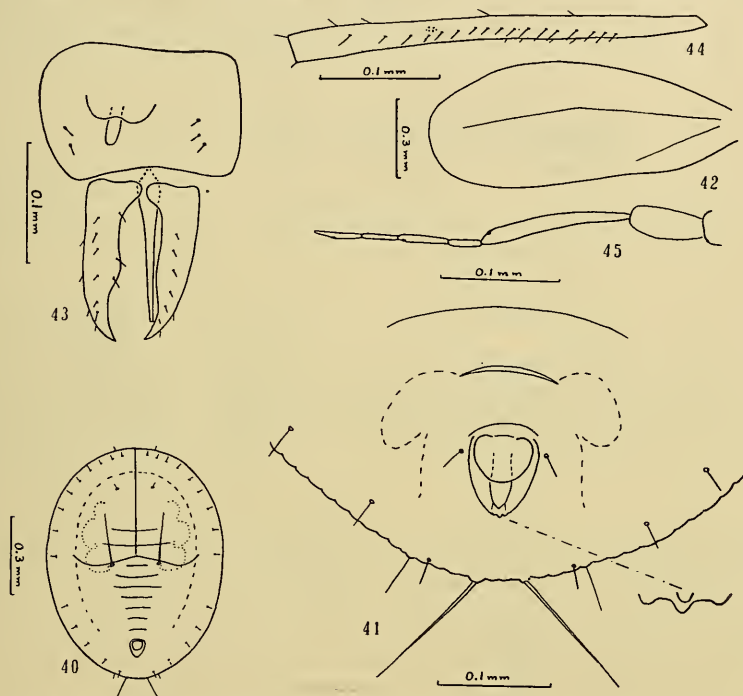
Aleyrodes atriplex Froggatt, 1911, *Agric. Gaz. N.S.W.*, 22:757.

Froggatt's description and figure do not permit identification of this species. Froggatt's presumed cotype material was kindly made available to me by the Entomological Branch of the N.S.W. Department of Agriculture for the preparation of the following description.

Larva.—Length 0.55 mm., width 0.40 mm. Very similar to the pupal case except for the two cephalic setae which are 0.12 mm. long. The two setae on the first abdominal

segment are 0.15 mm. long. The lateral margins of abdominal segments 6-8 are more distinctly lobed than in the pupal case.

Pupal Case (Text-fig. 40).—Length 0.85 mm., width 0.66 mm. Colour white, transparent. Shape elliptical, widest slightly anterior to mid-length. Thoracic and abdominal tracheal folds, pores and combs absent. No constriction of body across position of thoracic folds and no caudal invagination. Margin crenulate. Anterior marginal setae 0.01 mm. long, posterior marginal setae 0.04 mm. long. Submargin separated from disc by a rather faint line, bearing on each side 8 or 9 setae on the cephalothorax and 5 on each side of abdomen. Two short paramedian setae 0.02 mm. long. Two long paramedian setae on first abdominal segment, 0.2 mm. long. Sutures and segmentation as in figure. Vasiform orifice (Text-fig. 41) subcordate, 0.07 mm. long, 0.06 mm. wide,



40-45. *Aleyrodes atriplex* Froggatt. 40, Pupal case, dorsal; 41, Pupal case, vasiform orifice and caudal margin; 42, Female, forewing; 43, Male, vasiform orifice and genitalia; 44, Male, hind tibia; 45, Male, antenna.

caudally with small blunt median tooth and two less well defined paramedian teeth. Operculum semicircular, 0.04 mm. long, 0.05 mm. wide, occupying half or slightly more than half of the orifice. Lingula 0.045 mm. long, 0.02 mm. wide, widest about mid-length, about half its length exposed caudad of operculum, bluntly pointed, with two subapical setae.

Female.—Forewing (Text-fig. 42) length 1.16 mm., width 0.44 mm., white, immaculate, veins R_s and Cu present, R_s with single flexure at mid-length.

Male.—Clasper (Text-fig. 43) 0.125 mm. long, penis 0.125 mm. long. Operculum 0.03 mm. long, 0.05 mm. wide, posterior margin with median concavity. Lingula finger-like, sides sub-parallel, apex rounded. Hind tibia (Text-fig. 44) 0.35 mm. long with 16-17 setae in comb. Antenna (Text-fig. 45) 0.35 mm. long, segment 3 slightly shorter than segments 4-7 inclusive, 4 shortest, 6 slightly longer than 4; 5 and 7 sub-equal, sensillae distal on segments 3 and 5, slightly past mid-length on segment 7.

Lectotype.—Slide mount of pupal case from cotype material, in collection of Entomology Branch, N.S.W. Department of Agriculture, Sydney.

Type locality.—Broken Hill, N.S.W.

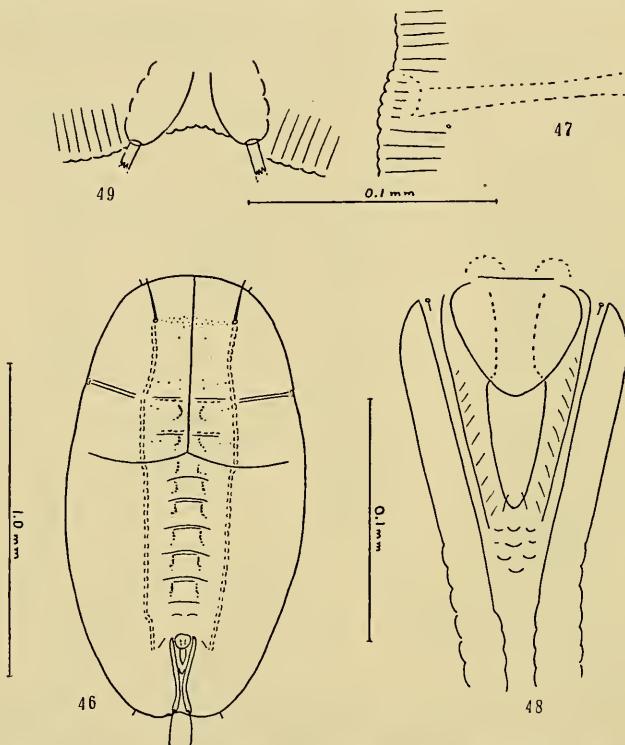
Food plant.—Saltbush (*Atriplex* sp.).

Material.—Cotype material: 1 card mount of adults, 1 card mount of leaf bearing larvae and pupal cases, from the type locality, 25/11/1911. A third card bearing adults is labelled as from Saltbush, Gosford, W.W.F., 20/3/1911.

Genus *ASTEROBEMISIA* Trehan.

ASTEROBEMISIA HELYI, n. sp. (Text-fig. 46-49).

Pupal Case (Text-fig. 46).—Length 1.40 mm., width 0.75 mm. Shape flat, elongate ovoid, widest about mid-length, little or not at all narrowed across thoracic folds, concave caudally. Colourless. Margin faintly crenulated or toothed. About 30 minute pores on submargin on each side. Submargin radially striate, bounded internally by a



46-49. *Asterobemisia helyi*, n. sp. 46, Pupal case, dorsal; 47, Pupal case, thoracic tracheal fold and comb; 48, Pupal case, vasisform orifice and anal furrow; 49, Pupal case, caudal margin.

faint submarginal line. Dorsal area defined by a narrow tuberculate line running from cephalic area to a point level with the apex of the operculum; narrowed and concave between cephalic setae and the pro-thoracic mesothoracic suture, narrowed slightly immediately caudad of the transverse moulting suture and again opposite the anterior margin of the eighth abdominal segment. Area between submargin and tuberculate line with minute rounded sculpturing. Mesothorax with transverse tuberculate and toothed line anteriorly and a pair of paramedian lobed figures caudad of this. Similar lobed figures on metanotum and on abdominal segments 1-6. A long stout cephalic seta, extending beyond the body margin, is present at the anterior end of the tuberculate line on each side. The transverse line between the cephalic seta bases is raised and beset with small circular tubercles. The anterior and posterior marginal setae are present. Thoracic tracheal folds (Text-fig. 47) present, ending in 4 or 5 short rounded teeth on the margin. Anal furrow present. Vasisform orifice (Text-fig. 48) 0.06 mm. wide, 0.12 mm. long, elongate triangular, caudally imbricated. Operculum subtriangular,

0.05 mm. wide, 0.05 mm. long. Lingula 0.09 mm. long, slender, pointed apically, slightly constricted subapically, distinctly constricted and shouldered about 0.04 mm. from base and with two subapical setae. Setae on eighth abdominal segment minute, situated between the vasiform orifice and the anterior end of the fold or ridge which contours the orifice. The ridges narrow behind the orifice but diverge again towards the caudal margin. They are somewhat tuberculate between orifice and margin. The caudal setae (Text-fig. 49) are situated on the caudal ends of the ridges. Anal furrow present, contained by the ridges.

Adult.—Unknown.

Holotype.—Slide mount of pupal case. Deposited in the collection of the Entomological Branch, N.S.W. Department of Agriculture, Sydney.

Paratypes.—In the collection of the author.

Type locality.—Botanic Gardens, Sydney, coll. P. C. Hely, 14/4/55.

Food plant.—Valencia orange.

Genus BEMISIA Quaintance & Baker.

BEMISIA DECIPIENS Maskell (Text-fig. 50–52).

Aleurodes decipiens Maskell, 1896 (in part—larva), *Trans. Proc. N.Z. Inst.*, 28:428–9, Pl. 28, fig. 1a–1d.

Aleyrodes decipiens Mask., Cockerell, 1902, *Proc. Acad. nat. Sci. Philad.*, 54:281.—Kirkaldy, 1907, *Bull. 2, Div. Ent. Hawaii*, p. 51.—Quaintance, 1908, *Genera Insect.*, fasc. 87, p. 5.

Bemisia decipiens (Mask.), Quaintance & Baker, 1914, *Bull. U.S. Bur. Ent.*, 27 (tech. ser.), Pt. 2:100.

Maskell, in describing this species, noted that what he supposed was the larva was larger than the pupa, showed faint indications of pupal structures and had a markedly different vasiform orifice. The "larva" is without doubt a pupa and must constitute the type of Maskell's species *decipiens*. The pupa is described elsewhere in this paper as a new species.

Larva.—Unknown.

Pupal Case (Text-fig. 50).—Length 1.6 mm., width 0.9 mm. Colour yellowish. Shape elongate elliptical, flat. Maskell shows 8 or 9 marginal wax processes on each side. Faint thoracic tracheal folds, no abdominal tracheal fold. Margin (Text-fig. 51) crenulate, about 13 crenulations in 0.1 mm., slight radial striation. Anterior and posterior marginal setae present. Caudal setae and eight abdominal setae present. Sutures and segmentation indistinct. Dorsal disc covered with subcircular pustules. Vasiform orifice (Text-fig. 52) elongate, pointed posteriorly, 0.13 mm. long, twice as wide as long. Floor sculptured. Operculum subsemicircular, length 0.04 mm., width 0.063 mm., occupying only one-third to one-quarter of orifice. Lingula very long, pointed, constricted at one-third length, swollen at two-thirds length, two setae apically. Caudal furrow narrow, extending from caudal margin to apex of orifice and contouring the orifice laterally.

Adult.—Unknown.

Type.—Slide mount (labelled "larva") of pupal case in Maskell Collection.

Type locality.—Botany, near Sydney, coll. Froggatt.

Food plant.—*Styphelia* (*Monotoca*) *elliptica*.

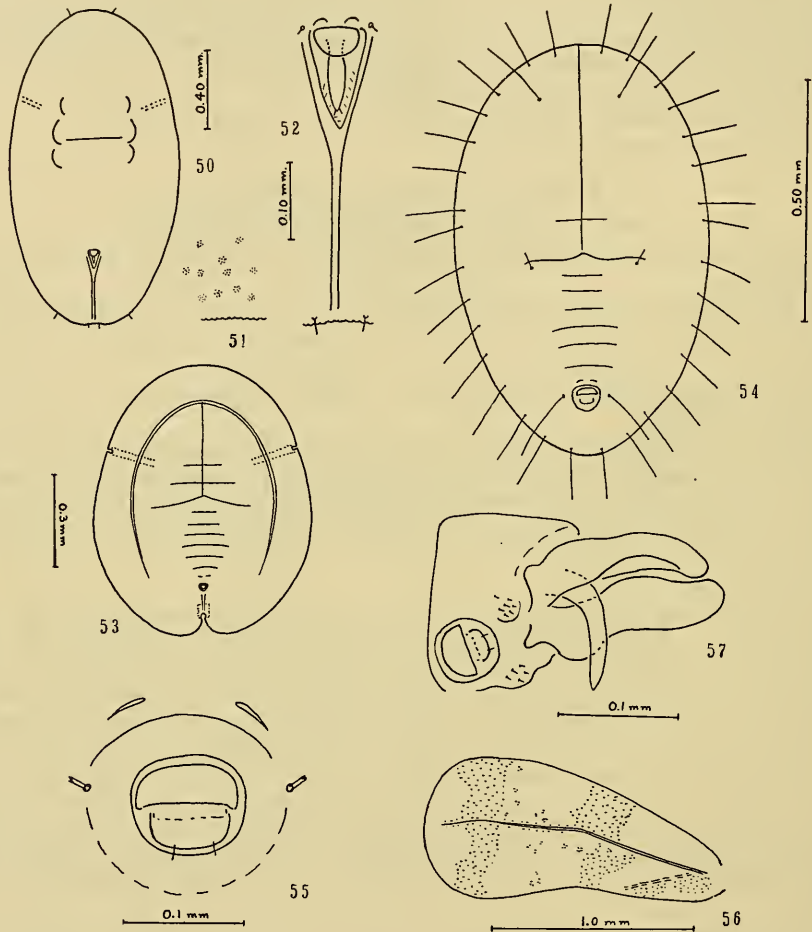
Genus DIALEURODES Cockerell.

DIALEURODES DRYANDRAE Takahashi (Text-fig. 53).

Dialeurodes dryandrae Takahashi, 1950, *Annot. zool. Jap.*, 23, No. 2:85–88, fig. 1.

Pupal Case (Text-fig. 53).—"Pale in colour, broad, broadest at the metathorax, narrower anteriorly, broadly rounded at the front margin, much indented at the hind end, scarcely constricted across the thoracic tracheal pores, flattened. Submarginal area defined by a wide line from the dorsal disk, exclusive of the hind part, broad; the line not reaching posteriorly beyond the level of vasiform orifice. Mid-thoracic suture reaching the submarginal area; suture between the thorax and abdomen not so; the

seventh and eighth abdominal segments not well defined; pockets narrow. Dorsum with many rather large, rounded, short papillae or corrugations, which are absent on the seventh and eighth tergites. Margin thin, a little crenate, but devoid of distinct teeth. Thoracic tracheal folds distinct. Thoracic tracheal pores large, widely thickened at the margin, within and slightly separated from the margin of pupa case, not closed, with 6 or 7 minute teeth, which are rounded apically. Vasiform orifice large, much wider than long, a little narrowed posteriorly, rounded at the hind margin, with many minute



50-52. *Bemisia decipiens* Maskell. 50, Pupal case, dorsal; 51, Pupal case, margin and discal ornamentation; 52, Pupal case, vasiform orifice and anal furrow.

53. *Dialeurodes dryandrae* Takahashi. (Figure after Takahashi.) 53, Pupal case, dorsal.

54-57. *Neomaskellia bergii* Signoret. 54, Pupal case, dorsal; 55, Pupal case, vasiform orifice; 56, Female, forewing; 57, Male, genitalia and vasiform orifice.

pointed teeth. Operculum occupying most of vasiform orifice, subcordate. Caudal furrow very narrow, broadened just at the base, without sculptures, much longer and narrower than the vasiform orifice. Caudal ridges broad, sclerotized. Pupa case about 0.93 mm. long, about 0.75 mm. wide." (Takahashi.)

Adult.—Unknown.

Type.—Pupal case deposited in Selangor Museum, Kuala Lumpur, Malaya.

Type locality.—Nedlands, W.A., coll. K. R. Norris, 20/5/1940.

Food plant.—*Dryandra floribunda*.

Genus NEOMASKELLIA Quaintance and Baker.

Key to Australian species (pupal cases).

- Pupal case with 15-16 pairs of spines arising from submargin; 8th abdominal setae long *bergii* Signoret.
 Pupal case with 12 pairs of spines on submargin; 8th abdominal setae short . . . *eucalypti*, n. sp.

NEOMASKELLIA BERGII Signoret (Text-fig. 54-57).

Aleurodes bergii Signoret, 1867, *Ann. Soc. ent. Fr.* (4), 8:426.

Aleurodes sacchari Maskell, 1890, *Trans. Proc. N.Z. Inst.*, 22:171.

Neomaskellia bergii (Mask.), Quaintance & Baker, 1917, *Proc. U.S. nat. Mus.*, 21:437-9.

Egg.—Length 0.272 mm., oval, stalk half as long as egg.

Pupal Case (Text-fig. 54).—Length 0.72-0.80 mm., width 0.432-0.552 mm. Shape elliptical, rather strongly arched. Colour dark to pale brownish. Submargin with row of about 32 prominent curved spines situated on tubercles. Margin deflexed under case, minutely and irregularly serrate. The cephalic setae and the eighth abdominal setae are very long; those on the first abdominal segment are short. Vasiform orifice (Text-fig. 55) elevated on tubercle-like structure, transverse, subcircular to elliptic. Operculum semicircular, caudal margin straight or irregularly curved. Lingula very broad with only apex showing beneath operculum.

Female.—Length 1.84 mm., colour brown. Antennae short thick, segment 2 globose; 3, 0.1 mm. long; 4, 0.03 mm.; 5, 0.055 mm.; 6, 0.033 mm.; 7, 0.033 mm. Head with vertex depressed mesad and lateral margins elevated. Forewing (Text-fig. 56) 1.36 mm. long, R_s and Cu present, with two transverse dark brown mottled areas. Vasiform orifice elliptic, transverse. Operculum semicircular, half filling orifice. Lingula very broad, exserted.

Male.—0.84 mm. long. Forewing 0.64 mm. long, R_s present, Cu absent. Claspers (Text-fig. 57) 0.144 mm. long, dark brown, not acutely pointed distally, thick.

Food plant.—Sugar cane (*Saccharum officinarum*).

A tropicopolitan species.

NEOMASKELLIA EUCALYPTI, n. sp. (Text-fig. 58-61).

Larva.—Unknown.

Pupal Case (Text-fig. 58).—Length 1.0 mm., width 0.65 mm. Colour black. Shape elliptical, convex, sides much deflexed under body especially in thoracic tracheal fold region. Margin (Text-fig. 59) toothed, about 16 teeth to 0.1 mm., teeth obsolete posteriorly but showing an apparent margin between posterior marginal setae. By reason of the deflexed sides the teeth point mesally, but 7 or 8 teeth point outward at the position of the thoracic tracheal fold. Twelve setae (Text-fig. 60) on each side, curved downward, hollow, with an aperture apically, embedded in a column of wax twice as long as the seta. Tracheal folds not evident. Eye spots present. One pair of paramedian cephalic pores, a pair of stronger pores on first abdominal segment, slightly smaller pores on segments 2-6. A pair of setae on eighth abdominal segment. Caudal setae present. Vasiform orifice (Text-fig. 61) raised, 0.065 mm. long, 0.070 mm. wide, subcircular, posterior margin toothed internally. Operculum subtrapezoidal, 0.025 mm. long, 0.04 mm. wide, concave apically. Lingula short, transverse.

Adult.—Unknown.

Holotype.—Slide mount of pupal case deposited in Maskell Collection.

Type locality.—Botanic Gardens, Sydney, coll. Froggatt, 1897.

Food plant.—*Eucalyptus* sp.

Described from unmounted material found in the Maskell Collection.

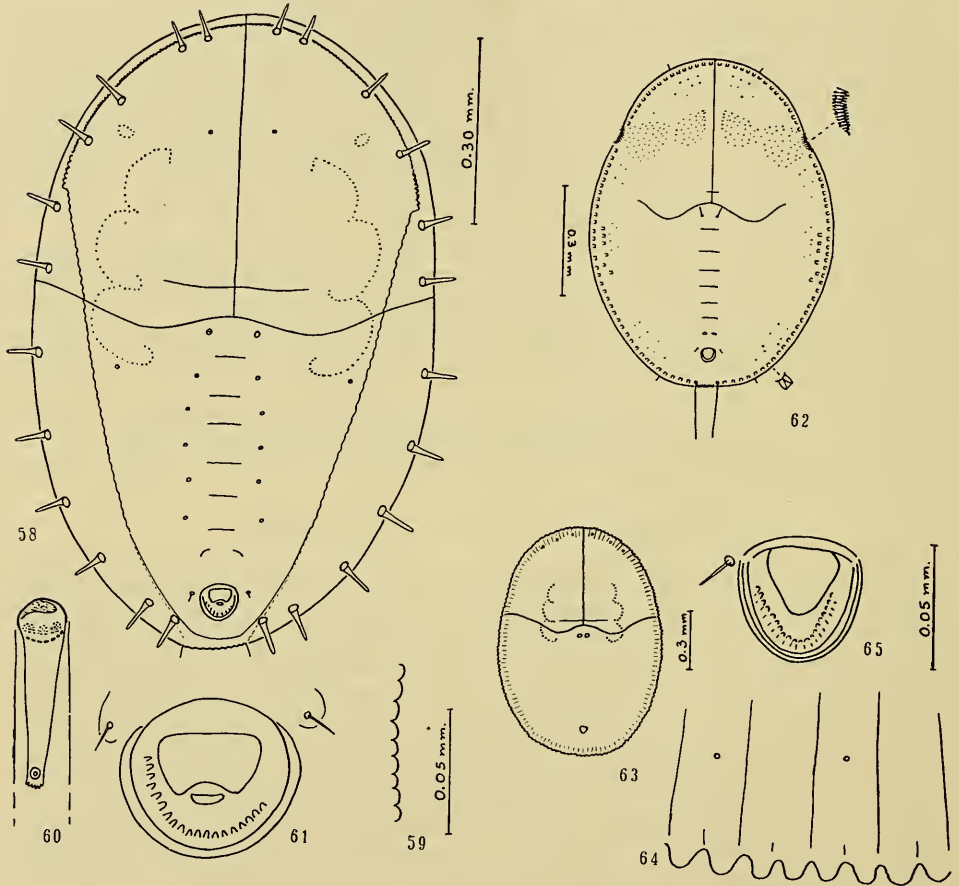
Genus ORCHAMUS Quaintance and Baker.

ORCHAMUS CITRI Takahashi (Text-fig. 62).

Aleuroplatus citri Takahashi, 1940, *Trans. nat. Hist. Soc. Formosa*, 30, 205:381-2, 1 fig.

Pupal Case (Text-fig. 62).—"Pale brownish yellow, covered with a brittle glassy secretion in dried specimens. Elliptic, about 1.4 times as long as wide, broadest at the basal part of abdomen, a little narrower anteriorly, constricted across the thoracic

tracheal combs, flattened, thin; cephalothorax a little shorter than the abdomen. Mid-thoracic suture reaching the margin, as long as the space between the vasiform orifice and the base of abdomen; thoracic segments not defined; suture between the thorax and abdomen, rather short, abruptly extending latero-anteriorly on the lateral part, reaching beyond the hind leg; abdominal segments distinct on the median narrow area, the basal segment the longest, pointed at the anterior end; rhachis absent. Dorsum with many distinct papillae arranged in a single row along the whole margin excepting the combs; about 6 or 7 similar papillae scattered on the lateral part of the abdomen; the papillae truncate apically, constricted near the base, nearly as long as wide, broadest



58-61. *Neomaskellia eucalypti*, n. sp. 58, Pupal case, dorsal; 59, Pupal case, margin; 60, Pupal case, marginal seta; 61, Pupal case, vasiform orifice.

62. *Orchamus citri* Takahashi. (Figure after Takahashi.) 62, Pupal case, dorsal.

63-65. *Tetraleurodes croceata* Maskell. 63, Pupal case, dorsal; 64, Pupal case, margin; 65, Pupal case, vasiform orifice.

at the base, equal in size, much shorter than the teeth of combs, 5 of them occupying a space of about 0.092 mm.; some small indistinct pores scattered on the submarginal area, which are not translucent and not discernible in some specimens; a pair of rather short stout setae present on the middle of the basal abdominal segment, a pair of shorter setae near the vasiform orifice as usual, a pair of long setae near the hind end. Eye spots absent. Margin scarcely crenate; many short thin dorsal lines running mesad from the margin; two pairs of usual marginal setae short. Thoracic tracheal folds very wide, not well defined, with numerous dots or very short spines; about 10 much larger

slender spines present in a group at the end of the fold; the spines directed mesally. Caudal ventral fold not defined, with some very small dots. Thoracic tracheal combs sunken, prominent, with about 12-14 long slender teeth, which are arranged regularly, obtusely-pointed apically, and the middle ones are longer than those on the sides. Caudal comb similar to the thoracic ones, with 8 or 9 similar teeth. Vasiform orifice nearly as long as wide, nearly as wide as the caudal comb, rounded, not notched, nearly as long as the space between the vasiform orifice and the caudal comb, with no teeth discernible; the anterior marginal area not defined. Operculum occupying about two-thirds of the orifice. Lingula concealed. Pupa case 0.92 mm. long, 0.66 mm. wide, 0.484 mm. wide across thoracic combs; vasiform orifice about 0.046 mm. wide; dorsal papilla 0.014 mm. long; thoracic comb 0.07 mm. wide; longest tooth of thoracic comb 0.018 mm." (Takahashi.)

Adult.—Unknown.

Cotypes.—In the collection of R. Takahashi.

Type locality.—Raymond Terrace, Sydney, N.S.W., coll. N. S. Noble, 25/5/1932 and Jan., 1940.

Food plant.—*Citrus* (Lemon).

The raising of *Orchamus*, previously a subgenus of *Aleuroplatus*, to generic rank has been proposed in another paper.

Genus TETRALEURODES Cockerell.

Key to Australian species (pupal cases).

1. Submargin distinctly separated by line or fold (3)
Submargin marked by radial striations only (2)
2. Submarginal striated area narrow; marginal teeth as long as wide; vasiform orifice toothed posteriorly *croceata* Maskell.
Submarginal striated area wide; marginal teeth much wider than long; orifice not toothed *niger* Maskell.
3. Marginal teeth truncate or square tipped *elaecarpi* Takahashi.
Marginal teeth rounded (4)
4. Abdominal segments wide, limited laterally by tuberculate ridge; tuberculate figure enclosing orifice *pluto*, n. sp.
Not as above (5)
5. Vasiform orifice toothed posteriorly; tracheal folds present; eye spots present .. *litzeae*, n. sp.
Not as above *stypheleae* Maskell.

TETRALEURODES CROCEATA Maskell (Text-fig. 63-65).

Aleurodes croceata Maskell, 1896, *Trans. Proc. N.Z. Inst.*, 28:428, Pl. 27, fig. 2.

Aleyrodes croceata (Mask.), Cockerell, 1902, *Proc. Acad. nat. Sci. Philad.*, 54:281.—Kirkaldy, 1907, *Bull. 2, Div. Ent. Hawaii*, p. 51.—Quaintance, 1908, *Genera Insect.*, fasc. 87, p. 5.

Aleurotrachelus croceatus (Mask.), Quaintance & Baker, 1914, *Bull. U.S. Bur. Ent.*, 27 (tech. ser.), Pt. 2:103.

Larva.—Length 0.18 mm., width 0.12 mm. Colour pale yellow. Shape elliptical, flat. Margin toothed, about 20 teeth to 0.1 mm. Two paramedian processes at mid-length on thorax, two rather long caudal setae. Vasiform orifice subtriangular, 0.03 mm. long, as wide as long. Operculum subtriangular, 0.025 mm. long, as wide as long.

Pupal Case (Text-fig. 63).—Length 1.15 mm., width 0.80 mm. Colour dark brown or black. Shape elliptical, convex. Thoracic and abdominal tracheal folds, pores and combs absent. Margin (Text-fig. 64) with well separated rounded teeth, 8 teeth to 0.1 mm. Submargin with radial striae at alternate interspaces giving the teeth the appearance of being paired. Minute pores on submargin mesad of teeth. Sutures distinct, abdominal segmentation indistinct. One pair of paramedian pores or processes on first abdominal segment, one pair of setae on eighth abdominal segment, one pair of caudal setae. Vasiform orifice (Text-fig. 65) subcircular, 0.045 mm. wide, posterior internal margin ribbed and toothed. Operculum subtriangular, 0.025 mm. long, as wide as long, occupying about half the orifice. Lingula obscured.

Adult.—Unknown.

Lectotype.—Pupal case on slide mount deposited in Maskell Collection. Prepared from duplicate unmounted cotype material, labelled "*croceata* ex *Stypheleia elliptica*, coll. Froggatt".

Type locality.—Botany, near Sydney, coll. Froggatt.

Food plant.—*Styphelia* (*Monotoca*) *elliptica*.

Material.—Unmounted duplicate material in the Maskell Collection.

The single slide mount of a pupal case in the Maskell Collection labelled *croceata*, and therefore the presumed type, is a specimen of *Aleurotrachelus limbatus*. The species was placed in *Aleurotrachelus* by Quaintance and Baker presumably after examination of this slide, since the *croceata* of Maskell's duplicate material has only a single row of marginal teeth and would not fall in that genus. Of existing genera it most nearly fits *Tetraleurodes*. *Aleurotrachelus limbatus* was found to be present with *croceata* in the duplicate material and it is presumed that Maskell recognized the distinctness of the two species, but, not realizing that *limbatus* was present in the material, mounted a specimen of *limbatus* as the type of *croceata*. There is little in the rather general description of Maskell's species that can be used to identify it with his duplicate material.

While *croceata* has a glassy wax ring it is not now of a yellow colour, though it may have bleached with time. Most of the pupae in the duplicate material have been parasitized.

TETRALEURODES ELAEOCARPI Takahashi (Text-fig. 66).

Tetraleurodes elaeocarp Takahashi, 1950, *Annot. Zool. Jap.*, 23, No. 2:85-88, fig. 3.

Pupal Case (Text-fig. 66).—"Black, strongly sclerotized, elliptic, not constricted. Submarginal area not separated from the dorsal disc, rather narrow, much darker in colour than the median area, without linear sculptures. Mid-thoracic suture reaching the submarginal area; cephalothorax without median ridge; pronotum not defined from the mesonotum; suture between the meso- and metanota prominent, long, straight, but not reaching the submarginal area; suture between the thorax and abdomen extending cephalo-laterally on the lateral part, nearly reaching the margin and the hind end of mesothorax; abdominal segments distinct in the median rather narrow area; the first abdominal segment much longer than the second; the seventh as long as the sixth, the eighth longer than the seventh and the vasiform orifice; the second-seventh each with a pair of small circular markings along the anterior margin; pockets distinct. Dorsum without granules and sculptures, with a pair of setae between the eyes, at the median part of the first abdominal segment, and also near the hind end. Eyes rather small separated from the submarginal area. Marginal teeth large, stout, wider than long, widened toward the base, truncated apically, 53 in number on the cephalothorax; a small indistinct semilunar paler part present near the base of each tooth. Thoracic tracheal folds and combs, and caudal furrow wanting. Vasiform orifice small, subcordate, protruding, slightly longer than wide, rounded, not notched, without teeth, nearly as long as the space between the orifice and submarginal area; the anterior marginal area defined. Operculum occupying the orifice. Venter densely marked with many sub-circular sculptures on the lateral part. Pupa case about 1.0 mm. long." (Takahashi.)

Adult.—Unknown.

Type.—Pupa case deposited in Selangor Museum, Kuala Lumpur, Malaya.

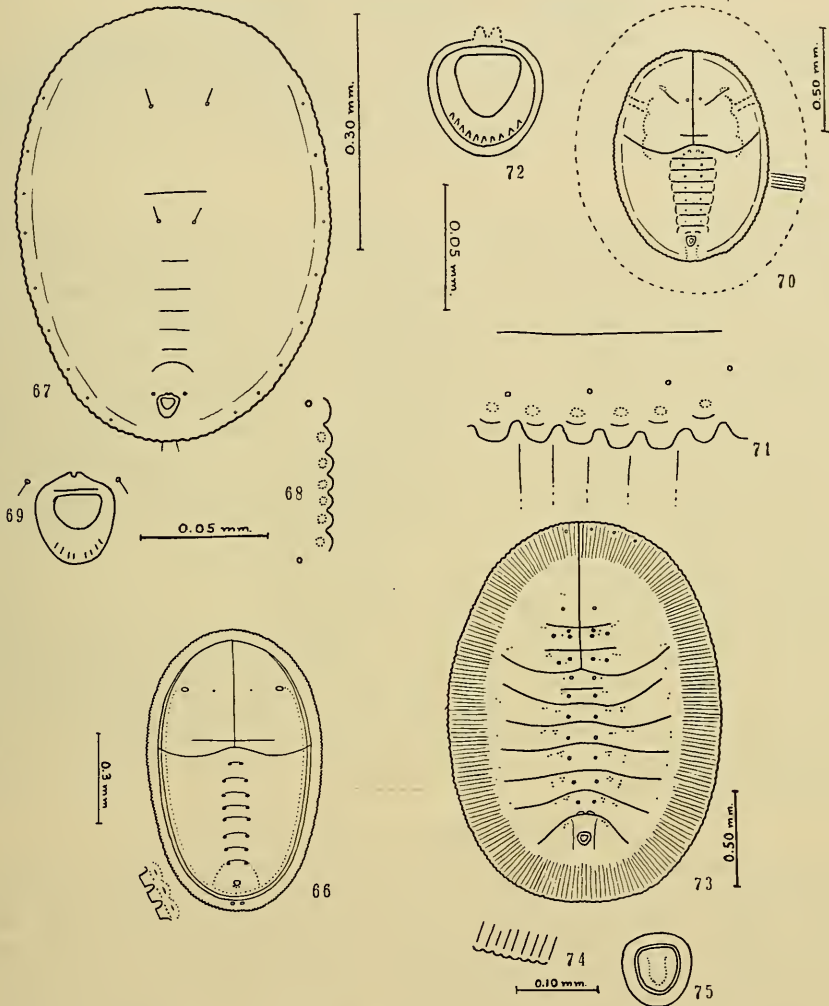
Type locality.—Sydney.

Food plant.—*Elaeocarpus reticulatus*.

TETRALEURODES LITZAE, n. sp. (Text-fig. 67-72).

Larva (Text-fig. 67).—Length 0.55 mm., width 0.41 mm. Colour black. Shape elliptical, flat. Margin (Text-fig. 68) toothed, about 12 teeth to 0.1 mm. with a paler refractile spot behind each tooth. A submarginal line is present. About 12 small circular pores on each half of the submargin. One pair of caudal setae and one pair on the eighth abdominal segment. Two setigerous paramedian pores at mid-length on thorax and two on first abdominal segment. Segmentation faint. Vasiform orifice (Text-fig. 69) 0.035 mm. long, 0.03 mm. wide, wider anteriorly and with two paramedian lobes anteriorly, posterior internal margin toothed or ribbed. Operculum transverse, 0.015 mm. long, 0.02 mm. wide.

Pupal Case (Text-fig. 70).—Length 1.0 mm., width 0.75 mm. Colour black. Shape elliptical, flat. Wax fringe 0.2 mm. wide. Margin (Text-fig. 71) toothed, teeth rounded, well separated, 6 or 7 teeth in 0.1 mm. Mesad of each tooth is a submarginal tooth or tubercle and a paler subcircular spot. Behind each alternate tooth is a small pore. Submarginal line 0.045 mm. from margin. Thoracic and abdominal tracheal folds present, wide. Teeth not modified in tracheal pore areas. Eye spots present. Two



66. *Tetraleurodes elaeocarpi* Takahashi. (Figure after Takahashi.) 66, Pupal case, dorsal.

67-72. *Tetraleurodes litzeae*, n. sp. 67, Larva, dorsal; 68, Larva, margin; 69, Larva, vasiform orifice; 70, Pupal case, dorsal; 71, Pupal case, margin; 72, Pupal case, vasiform orifice.

73-75. *Tetraleurodes niger* Maskell. 73, Pupal case, dorsal; 74, Pupal case, margin; 75, Pupal case, vasiform orifice.

paramedian pores caudad of eye spots. First abdominal segment with two paramedian pores and two smaller pores, the following six segments each with two paramedian pores. Scattered minute paired pores present especially in the cephalic area. Vasiform orifice (Text-fig. 72) 0.05 mm. long, 0.045 mm. wide, with two paramedian anterior processes, posterior internal margin toothed. Operculum not filling orifice, subtriangular, 0.025 mm. long, 0.028 mm. wide.

Adult.—Unknown.

Holotype.—Pupal case on slide mount deposited in Maskell Collection.

Type locality.—Richmond, N.S.W.

Food plant.—*Litsea dealbata*.

Material.—Described from unmounted material in Maskell Collection.

The species has been allocated to *Tetraleurodes* although it does not fit it entirely.

TETRALEURODES NIGER Maskell (Text-fig. 73-75).

Aleurodes niger Maskell, 1896, *Trans. Proc. N.Z. Inst.*, 28:437, Pl. 33, fig. 1.

Aleyrodes nigra, Cockerell, 1902, *Proc. Acad. nat. Sci. Philad.*, 54:281.

Aleyrodes niger Mask., Kirkaldy, 1907, *Bull. 2, Div. Ent. Hawaii*, p. 62.—Quaintance, 1908, *Genera Insect.*, fasc. 87, p. 7.

Aleurolobus niger (Mask.), Quaintance & Baker, 1914, *Bull. U.S. Bur. Ent.*, 27 (tech. ser.), Pt. 2:100.

Larva.—Unknown.

Pupal Case (Text-fig. 73).—Length 1.90 mm., width 1.35 mm. Colour black. Shape elliptical, moderately convex. Margin (Text-fig. 74) weakly crenulated, about 8 crenulations in 0.1 mm. Submarginal area radially striate, striae extending inwards 0.2 mm. There are a number of small pores near the margin. The marginal striations become less regular mesally and there is no distinct line between the submargin and the disc. The abdominal sutures end at the inner margin of the submargin. Dorsal pores as in figure. In addition to the circular pores there are a number of minute sensillae on the dorsal disc as well as at the lateral margins of the abdominal segments. Thoracic and abdominal tracheal folds pores and combs absent. No specialized teeth in the pore areas. Vasiform orifice (Text-fig. 75) subcircular, internal diameter 0.05 mm. Operculum appears to fill the orifice. Lingula subparallel sided, bluntly pointed.

Adult.—Unknown.

Lectotype.—Pupal case on slide mount in Maskell Collection.

Type locality.—Melbourne, Vict., coll. French.

Food plant.—*Acacia pycnantha*.

The type specimen is very black, but the location of the pores, sutures, etc., can be seen by strong transmitted light. The species was placed in *Aleurolobus* by Quaintance and Baker (1914) who had Maskell's material available for study, but it lacks the trilobed figure surrounding the orifice which is characteristic of the genus. The species was not keyed or mentioned by Quaintance and Baker (1917) in dealing with the genus *Aleurolobus*.

TETRALEURODES PLUTO, n. sp. (Text-fig. 75-78).

Larva.—Unknown.

Pupal Case (Text-fig. 76).—Length 1.18 mm., width 0.80 mm. Colour black. Shape elliptical, convex, with a depression between the sloping submarginal area and the convex dorsum. The abdominal region bears a forwardly-directed block of wax, the posterior portion of which is separated and directed posteriorly. The thoracic and abdominal tracheal folds are visible ventrally as white areas in unmounted specimens. Thoracic folds faintly visible in mounts, with two marginal teeth in the pore area usually smaller. Margin (Text-fig. 77), toothed, about 7 teeth to 0.1 mm. Faint indications of a second row of teeth or crenulations just mesad of the marginal teeth. Submarginal area striate, with a number of simple pores near inner margin and midway a series of minute paired pores, of which one is larger than the other. The pores on the dorsum are similarly paired. Sutures, segmentation and pores as in figure. Abdominal segments well marked, wide, lateral boundaries sculptured or tuberculate. One pair of minute setae on eighth abdominal segment. Vasiform orifice (Text-fig. 78) semicircular, 0.03 mm. long, 0.04 mm. wide, enclosed by a lobed figure whose posterior and lateral margins are tuberculate. Operculum occupying most of orifice, semicircular, 0.023 mm. long, 0.03 mm. wide. Lingula not visible.

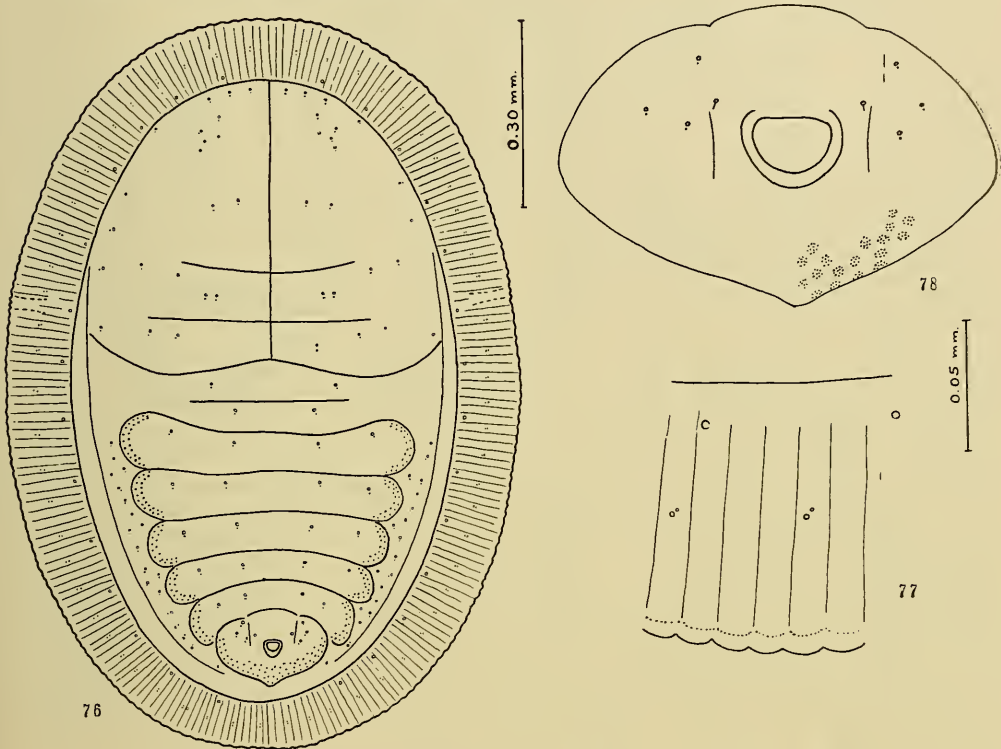
Adult.—Unknown.

Holotype.—Pupal case on slide mount deposited in Maskell Collection.

Type locality.—Western Australia.

Food plant.—"Common on a number of yellow flowering plants."

This species is described from material in the Maskell Collection, labelled "*Aleurodes* from Lea, his 206, West Australia, 1896".



76-78. *Tetraleurodes pluto*, n. sp. 76, Pupal case, dorsal; 77, Pupal case, margin; 78, Pupal case, vasiform orifice.

TETRALEURODES STYPHELIAE Maskell (Text-fig. 79-82).

Aleurodes stypheliae Maskell, 1896, *Trans. Proc. N.Z. Inst.*, 28:442, Pl. 25, fig. 1.

Aleyrodes stypheliae Mask., Cockerell, 1902, *Proc. Acad. nat. Sci. Philad.*, 54:281.—Kirkaldy, 1907, *Bull.* 2, *Div. Ent. Hawaii*, p. 71.—Quaintance, 1908, *Genera Insect.*, fasc. 87, p. 8.

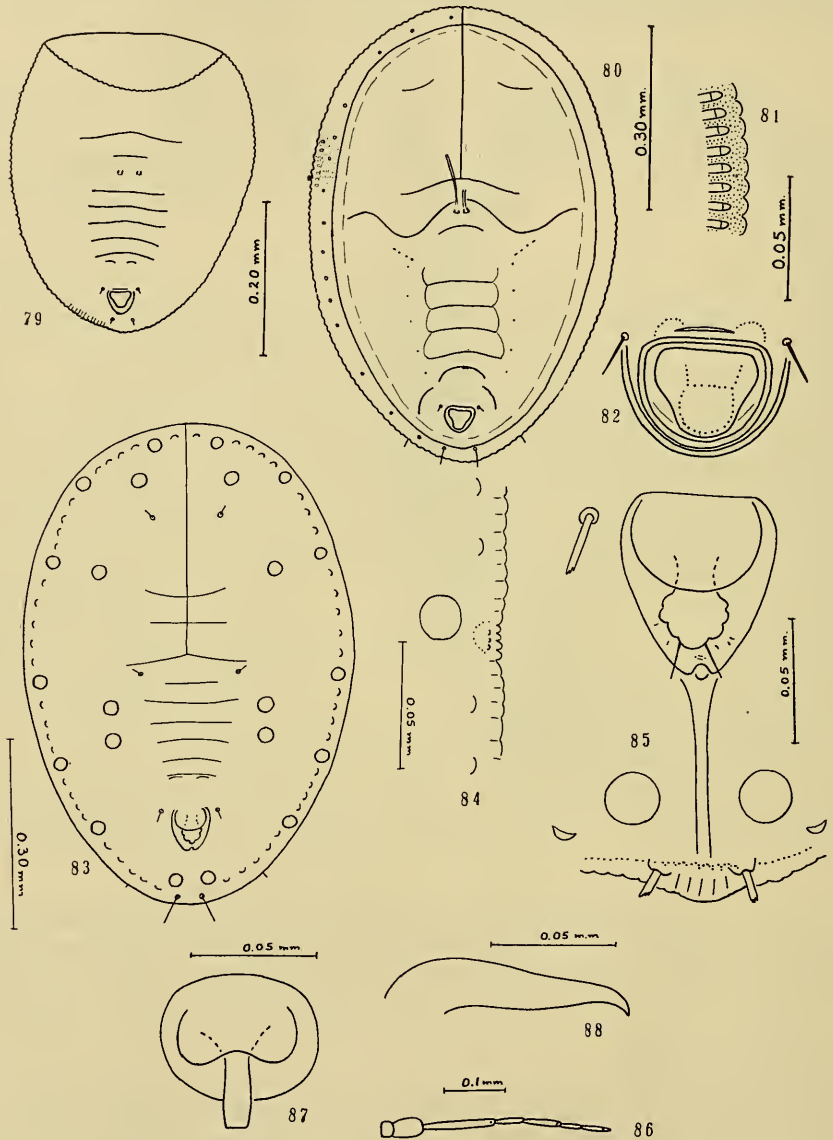
Tetraleurodes stypheliae (Mask.), Quaintance & Baker, 1914, *Bull. U.S. Bur. Ent.*, 27 (tech. ser.), Pt. 2:108.

Egg.—Oval, yellow.

Larva (Text-fig. 79).—Exuviae often attached to pupal case. Length 0.46 mm., width 0.31 mm. Colour dark brown. Shape elliptical, flat. Margin crenulated, about 16 crenulations to 0.1 mm. Margin radially striated. Segmentation as in figure. A pair of long processes arise from two paramedian pores on the first abdominal segment. Four pairs of small pores on the lateral margins of abdominal segments 3-6. One pair of setae on eighth abdominal segment and one pair of caudal setae. Vasiform orifice subtriangular, 0.035 mm. long, as wide as long. Operculum subtriangular, 0.03 mm. wide, 0.027 mm. long, sides somewhat concave, nearly filling orifice. Lingula not discernible.

Pupal Case (Text-fig. 80).—Length 0.71 mm., width 0.48 mm. Colour dark brown. Shape elliptical, slightly more rounded anteriorly, flat. Margin (Text-fig. 81) crenulated, about 11 crenulations in 0.1 mm., mesad of each crenulation is a lighter spot. Submarginal

area extends mesad about 0.04 mm. and has darker striae, and among them about 16 small pores on each side. Submargin separated from disc by a narrow less-pigmented area. No thoracic or abdominal tracheal folds, pores or combs. Sutures and segmentation as in figure. Two long processes arise from paramedian pores on the first



79-82. *Tetraleurodes stypheliae* Maskell. 79, Larva, dorsal; 80, Pupal case, dorsal; 81, Pupal case, margin; 82, Pupal case, vasiform orifice.

83-88. *Trialeurodes vaporariorum* Westwood. 83, Pupal case, dorsal; 84, Pupal case, thoracic tracheal pore area; 85, Pupal case, vasiform orifice and caudal margin; 86, Female, antenna; 87, Female, vasiform orifice; 88, Male, penis lateral.

abdominal segment. Abdominal segments 3-6 more strongly limited laterally. A pair of lateral pores on segments 3-7. Posterior marginal, caudal and eighth abdominal setae present. Vasiform orifice (Text-fig. 82) subsemicircular, 0.05 mm. long, as wide

as long. Operculum nearly filling orifice, 0.03 mm. long, 0.04 mm. wide, subtrapezoidal, lateral margins concave, broadly rounded apically. Lingula obscured.

Adult.—Unknown.

Lectotype.—Pupal case on slide mount in Maskell Collection.

Type locality.—Melbourne, Vict., coll. French. (Also from Sydney, coll. Froggatt.)

Food plant.—*Styphelia (Monotoca) richiei*.

Material.—Slide of larva and unmounted duplicate material in Maskell Collection.

Genus TRIALEURODES Cockerell.

TRIALEURODES VAPORARIORUM Westwood (Text-fig. 83-88).

Aleyrodes vaporariorum Westw., 1856, *Gardener's Chronicle*, p. 852.

For synonymy and full description see Russell, 1948, *Misc. Publ. U.S. Dep. Agric.*, 635:43-49.

Pupal Case (Text-fig. 83).—Length 0.75-1.10 mm., width 0.5-0.75 mm. Derm thin and colourless except for the papillae. Shape elliptical. Case raised off leaf on vertical palisade of white wax. Margin crenulated, about 12 crenulations in 0.1 mm. Thoracic tracheal pore area (Text-fig. 84) marked by narrowing and depth of 3-10 crenulations. Commonly 75-110 submarginal papillae in a single row; 1-9 pairs may be larger than the others but these may be absent. Usually four pairs of subdorsal papillae but these may be absent. When present one pair is cephalic, one pair mesothoracic, and one pair on each of the third and fourth abdominal segments. Setae: one pair cephalic, one pair first abdominal, one pair eighth abdominal often very long, and one pair caudal usually long. Vasiform orifice (Text-fig. 85) 0.056-0.076 mm. long, 0.056-0.070 mm. wide, cordate, notched at posterior tip and with prominent tooth in notch. Operculum 0.036-0.048 mm. long and 0.044-0.060 mm. wide, cordate. Lingula 0.040-0.060 mm. long, 0.024-0.032 mm. wide, with two long setae and three pairs of lateral lobes and one median unpaired lobe. Caudal furrow present, narrow.

Female.—Antennae (Text-fig. 86) with segment 3 shorter than segments 4-6 combined, 5 nearly twice as long as 6, flagellum of 7 short. Wings white, unspotted, forewing 1.0 mm. long, R_1 absent. Hind tibia with 13-16 setae in comb. Operculum (Text-fig. 87) 0.02 mm. long, 0.045 mm. wide. Lingula truncate and excavate apically, length 0.03 mm., width 0.01 mm.

Male.—Penis (Text-fig. 88) length 0.1 mm., tapering and slightly falcate at apex in lateral view.

A cosmopolitan species with numerous food plants.